

Instruction Manual

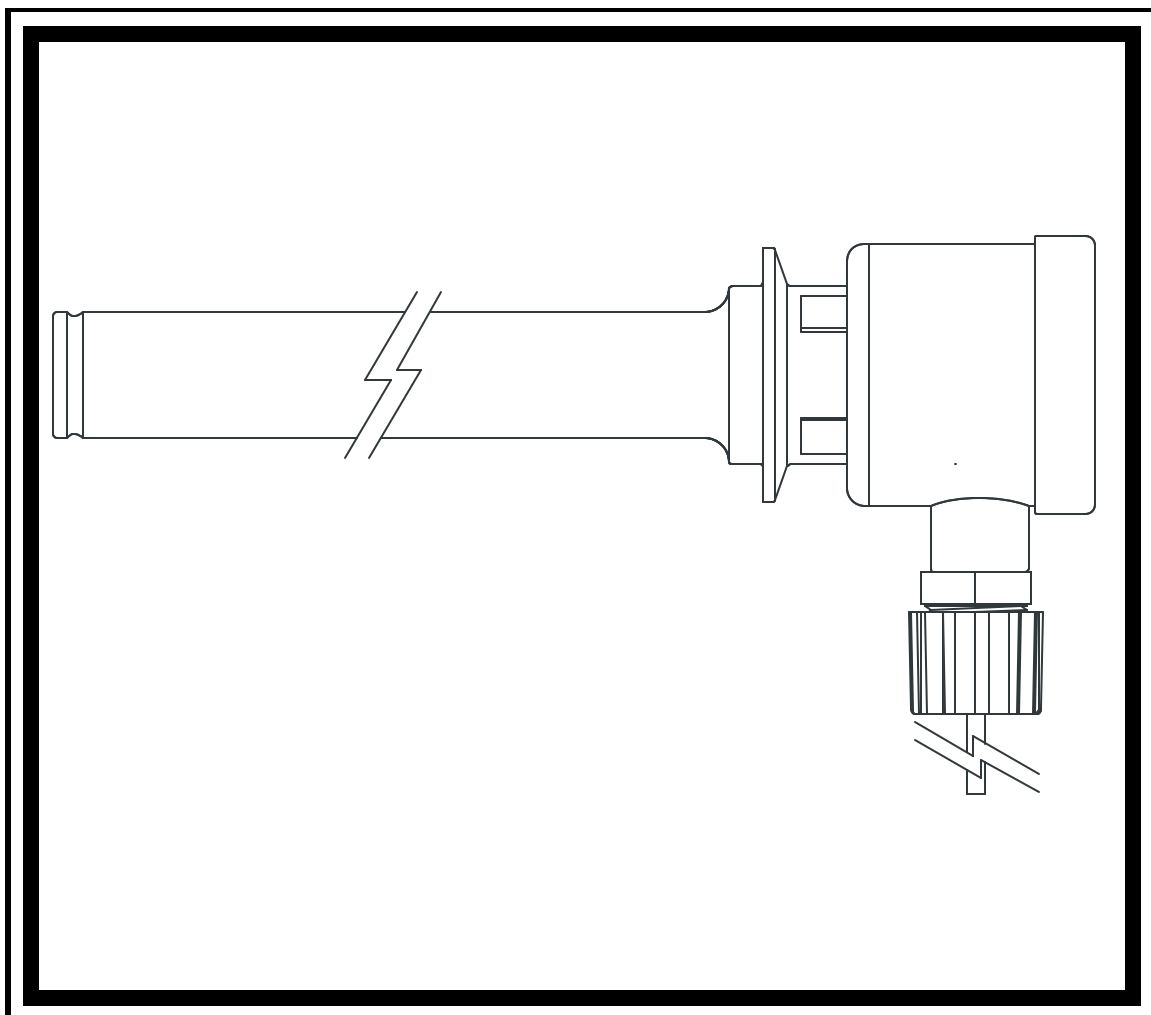


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Instrument Model Number _____

Instrument Serial Number _____



LD Level Transmitter

Table of Contents

Section 1 - General	Page
1.1 INTRODUCTION	3
1.2 SPECIFICATIONS	3
1.3 DESCRIPTION	4
Section 2 - Installation	
2.1 MOUNTING	5
2.2 ELECTRICAL WIRING	5
2.3 TRANSMITTER ELECTRONIC "ZERO" CALIBRATION	7
2.4 CALIBRATION VERIFICATION - UTILIZING ON-BOARD SETUP	8
2.5 CALIBRATION VERIFICATION - UTILIZING EXTERNAL PRESSURE SOURCE	9
2.6 CALIBRATION - UTILIZING ON-BOARD SETUP	11
2.7 CALIBRATION - UTILIZING EXTERNAL PRESSURE SOURCE	13
2.8 CONTROLLER TUNING	15
Section 3 - Maintenance and Troubleshooting	
3.1 GENERAL	16
3.2 CALIBRATION CHECKS	16
3.3 VENT SYSTEM	16
3.4 TROUBLESHOOTING	17
Appendix A - Warranty and Return	18
FIGURES	
Figure 1-1 "LD" Dimensional Drawing	4
Figure 2-1 Typical Application View	5
Figure 2-2 Required Supply Voltages	6
Figure 2-3 Transmitter Loop Diagram	6
Figure 2-4 Zero Calibration Procedure	7
Figure 2-5 Current Cal Verification Hookup	8
Figure 2-6 Pressure Pump	9
Figure 2-7 Pressure Cal Verification Hookup	10
Figure 2-8 Field Cal Hookup	12
Figure 2-9 Pressure Pump Hookup	13
Figure 2-10 Pressure Cal Hookup	14

Section 1 General

1.1 INTRODUCTION

The Anderson "LD" level transmitter is a unique device designed for level control applications where pressure based technology provides the best overall solution, but where bottom access for the sensor is not available or preferable. This sensor is designed to be mounted on the top of the vessel with the extension tube positioning the sensing diaphragm near the bottom of the tank. Common applications include rotary filler bowls, surge tanks and small processing storage vessels where bottom access is impractical. With no moving parts, no air required, and wide compensated temperature range the LD provides accuracy and repeatability in applications where other sensing technologies have been proven unreliable.

1.2 SPECIFICATIONS

Performance

Upper Range Limit (URL)	72" water column (w.c.)
Minimum Span:	30" w.c.
Over-Range Capacity:	2.5 times the URL (180" w.c.)
Accuracy:	$\pm 0.75\%$ of URL ($\pm 0.5"$ w.c.)
Repeatability:	within $\pm 0.3\%$ of URL ($\pm 0.2"$ w.c.)
Stability:	Within published specification for one (1) year minimum
Compensated Temp. Range: (process)	30°F to 220°F (-1°C to 104°C)
Compensated Temp. Range: (ambient)	30°F to 120°F (-1°C to 49°C)
Effect of Process/Ambient Temperature Change:	$\pm 0.40\%$ of URL per 10°F
Humidity:	0-100% RH, Condensing

Power Signal

Output:	4-20mA dc
Loop Power required:	12-40 Vdc
Effect of Voltage Change:	$\pm 0.05\%$ of URL per 30 volts
Load Impedance:	1550 Ohms at 40 VDC
Cable Recommended:	18-24 AWG, .169" to .209" diameter, stranded, 2 conductor with ground, shielded and PVC coated for use with seal-tight wire grommet

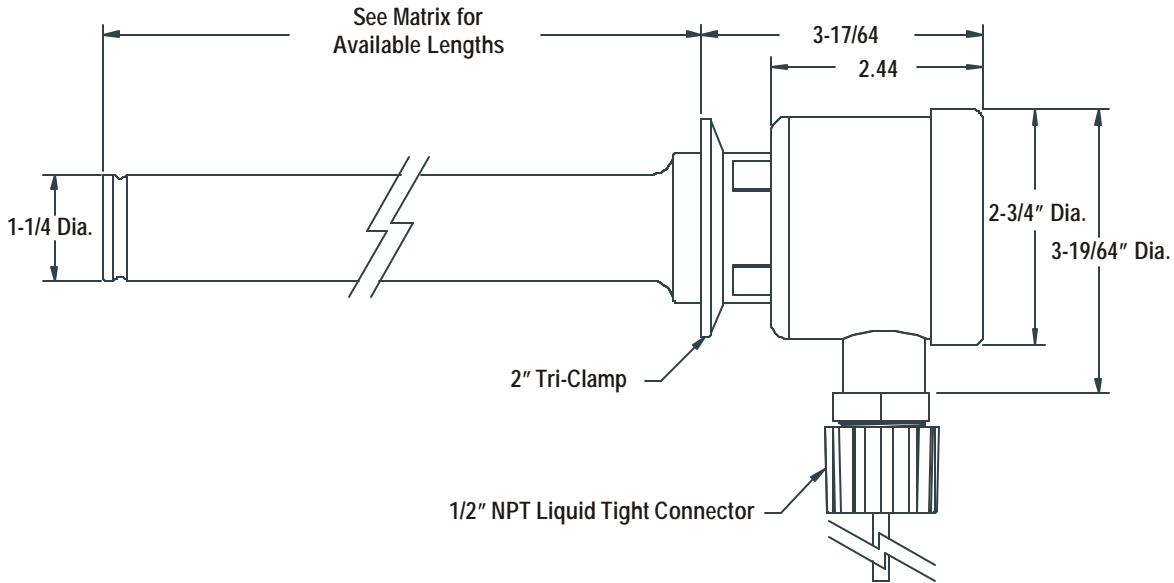
Materials/Construction

Housing /Wiring Head:	304 stainless steel
Wetted Parts:	316L stainless steel
Surface Finish:	Ra=25 microinches or better (wettedparts)
Housing Rating:	NEMA 4X, IP-65

Agency Approvals

Electronic "Noise" Immunity:	Designed to meet IEC 801-2, -3 and -4, Level 3, CE Compliant
Sanitary Standards:	Complies with all applicable provisions of 3-A Sanitary Standards (74-00).
Hazardous Locations:	UL, Intrinsically safe for use in Class 1, Div. 1 Groups A-D.
Warranty:	All units are covered by a two (2) year warranty against defects in material and workmanship when installed and maintained according to the instruction manual provided.

FIGURE 1-1 "LD" DIMENSIONAL DRAWING



1.3 DESCRIPTION

The "LD" transmitter has been designed for measuring liquid level in control applications where a top-mount sensor is preferable or required for optimum performance. Typical applications include rotating filler bowls, surge tanks, or other atmospheric vessels where the "dipstick" design makes mounting and wiring simpler than a bottom mount sensor or other technology.

The LD outputs a standard 4-20mA dc signal for direct connection with a simple controller or indicator, or to a PLC. Units are calibrated at 0-30 " w.c. for all lengths between 15" and 30". For longer lengths, units are calibrated to match the probe length up to the maximum of 72". Correction for product specific gravity different than water can be made at the factory, or in the field using the unique "push button" field calibration feature.

Temperature compensation provides a usable range of up to 220 deg F and is designed to quickly correct for temperature shocks common in the intended applications. The LD can be left in place for CIP and sterilization to protect against handling damage.

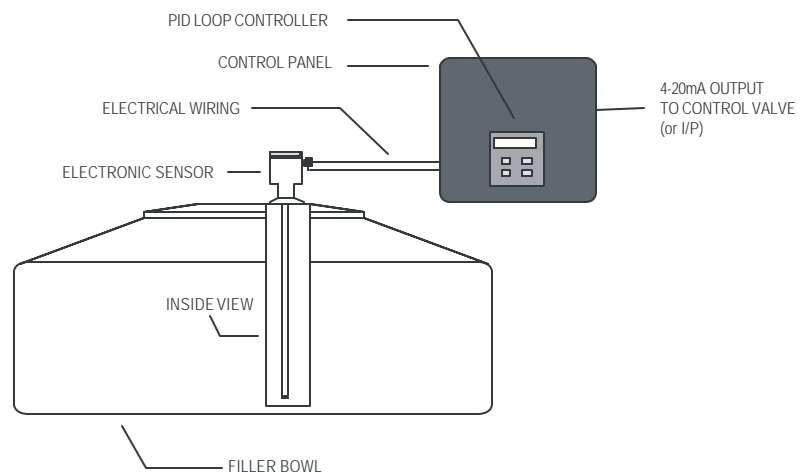
The standard fitting on the LD is a 2" tri-clamp and all wettable surfaces are constructed of 316 "L" stainless steel.

Section 2 - Installation

2.1 MOUNTING

The transmitter is designed to be mounted on the process vessel. Connection is secured via 2" Tri Clamp - gasket to be customer supplied. A typical application is as follows:

FIGURE 2-1 TYPICAL APPLICATION VIEW



2.2 ELECTRICAL WIRING

2.2.1 Signal Cable

Anderson recommends the use of 18-24 AWG, 4 conductor cable. In addition, it should be foil shielded with a continuous drain wire (If Factory supplied, Belden #9534 or equivalent). Although only two conductors and the drain wire are utilized, cable as specified above will retain its roundness when inserted into the seal-tight grommet. This will prevent moisture from entering the conduit housing of the transmitter. The drain (ground) wire should be attached to ground at only the receiver end. Be sure that this wire is cut back far enough so as not to make connection with any stainless steel inside the conduit head of the sensor. Installation as described will prevent induced ground loop currents from flowing through the drain wire causing errors in the mA signal.

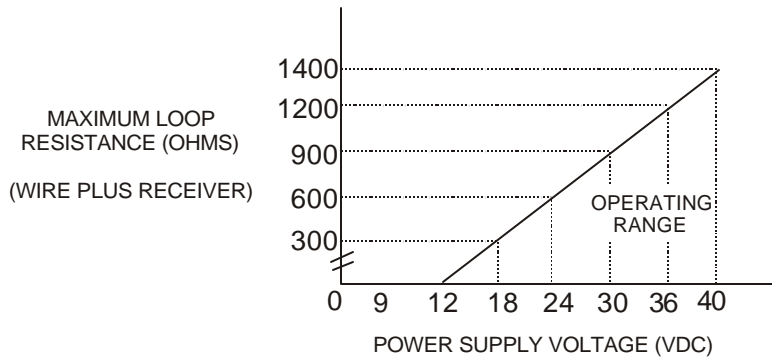
WARNING: To prevent signal interference, do not run signal cable closer than 12" to AC wiring, or if you must, cross it at a 90° angle.

NOTE: If using customer supplied cable, be sure it is .109" - .209" O.D.. The use of larger diameter cable will make entry of the cable into the conduit housing difficult, while the use of smaller diameter cable may allow moisture to enter the transmitter.

2.2.2 Transmitter Power and Wiring

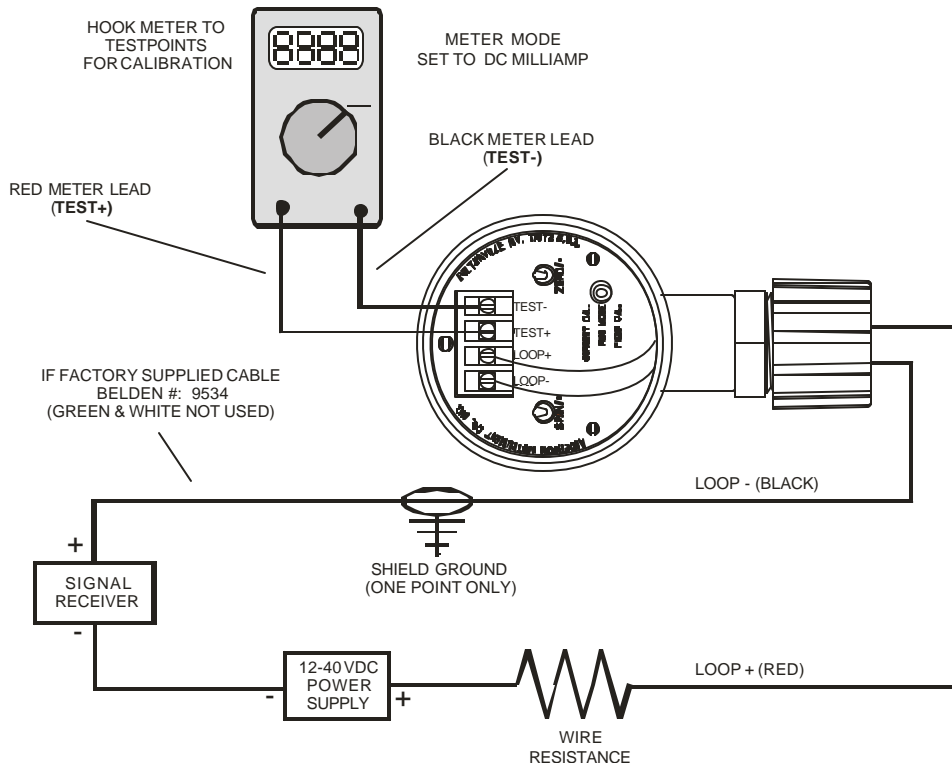
The model LD Level Transmitter requires 12-40 VDC for proper operation. If below 24 VDC, a regulated supply is recommended. The total loop resistive load (signal wire, signal receiver, optional display, but not including transmitter) must not exceed the value given in Figure 2-3 corresponding to the voltage of the DC power supply used. Allow 23.3 ohms per 1000 feet for each conductor of 24 AWG sized wire (the smaller the AWG gauge, the larger the wire cross section).

FIGURE 2-2 REQUIRED SUPPLY VOLTAGES



It is recommended that the leads be stripped and tinned to provide for optimum signal connections. Wire to the integral terminal block in the transmitter conduit heads as illustrated in Figure 2-3.

FIGURE 2-3 TRANSMITTER LOOP DIAGRAM



2.3 TRANSMITTER ELECTRONIC "ZERO" CALIBRATION

Upon installation of a new Factory Calibrated unit, and as part of routine maintenance, a Zero calibration adjustment must be performed. The transmitter ZERO, (signal output with no pressure applied to the diaphragm), is 4.00 mA. Although the calibration may be performed without additional tools, testpoints have been provided for monitoring the mA output signal from the transmitter. For maximum accuracy we recommend performing a sensor zero about three (3) weeks after initial installation, or following several heat/cool cleaning cycles.

See Figure 2-4, Zero Calibration Procedure, for the location of the Zero switch. Depressing for 5-8 seconds automatically "zeros" the output.

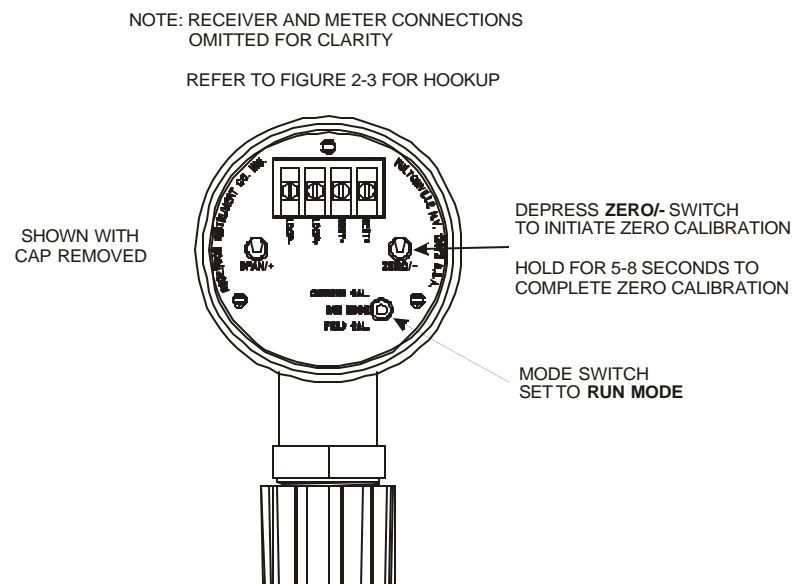
CAUTION:

- Field wiring **MUST** be complete – loop power (12-40 VDC) applied
- Transmitter **MUST** be installed in vessel
- Verify **NO** product contact to diaphragm
- Vessel **MUST** be vented to atmosphere
- **DO NOT** depress SPAN switch
- **MODE** switch set to **RUN MODE**

Once Zero calibration has been performed, sensor output will return to 4.00 mA. This is the proper output to signify an empty vessel – ZERO calibration is complete.

NOTE: No adjustment to the SPAN is necessary. ZERO and SPAN settings are non-interactive, having no effect on each other.

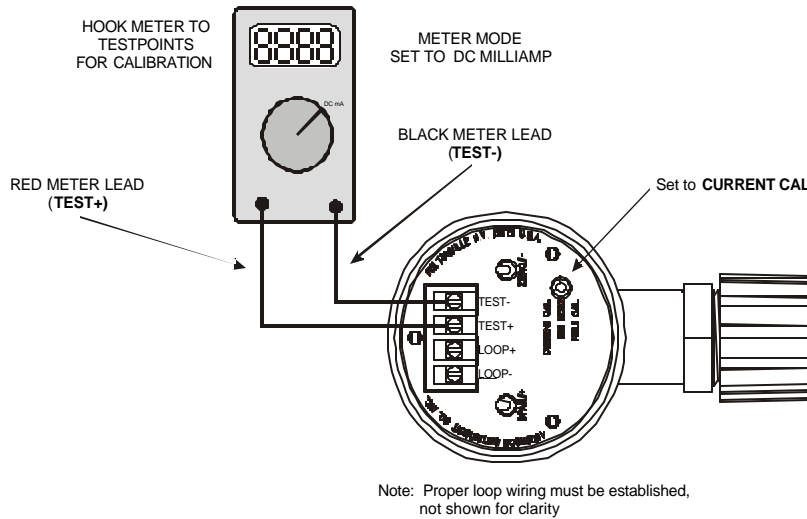
FIGURE 2-4 ZERO CALIBRATION PROCEDURE



2.4 CALIBRATION VERIFICATION - UTILIZING ON-BOARD SETUP

Utilizing a digital multimeter attached to the on-board testpoints, the LD transmitter may be switched to an alternate output mode where the signal viewed on the meter is proportional to the current calibration range of the transmitter. Hookup is as follows:

FIGURE 2-5 CURRENT CAL VERIFICATION HOOKUP



As shown, set operating switch to CURRENT CAL position. The signal displayed on the meter at this point is directly proportional to the current SPAN setting of the sensor. Using the following procedure, this value can be converted to the "Inches of Water Column" calibration value:

- Perform calculation to determine current inches of Water Column calibration
$$[(\text{Meter Reading} - 4.00) \div 16] \times 145 = \text{Current Cal in "w.c.}$$
- Once calibration has been determined, move switch back to RUN position to continue operation
- If value determined matches value in model number, unit is properly calibrated
- If value does not match value in model number, sensor calibration has been altered since unit left the factory – see sections that follow for proper re-calibration procedures

2.5 CALIBRATION VERIFICATION - UTILIZING EXTERNAL PRESSURE SOURCE

If available, an external pressure calibrator may be used to determine the current calibration of a sensor. Test procedure is as follows:

FIGURE 2-6 PRESSURE PUMP

HOOKUP

Digital Pressure Calibrator
(Suggested Unit)

Crystal Engineering
Phone: 800-444-1850

Model: 212-030PSI-G-HR

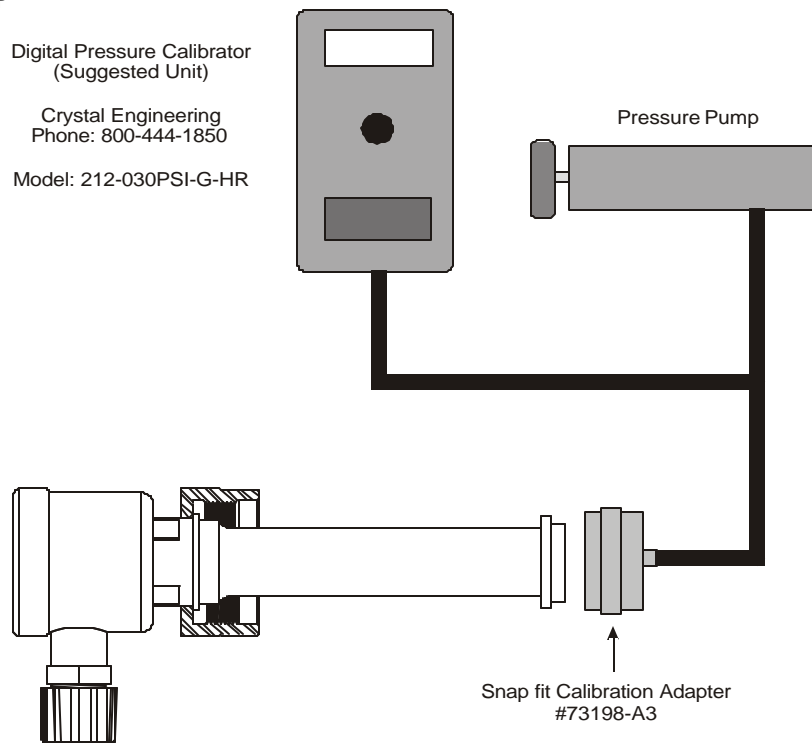
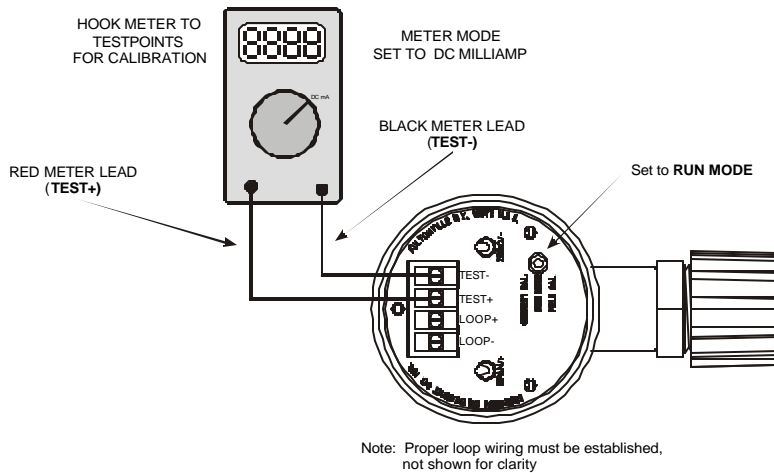


FIGURE 2-7 PRESSURE CAL VERIFICATION HOOKUP



1. Remove sensor from vessel if already installed – leave loop wiring attached
2. Provide loop power to sensor if performing a bench test
3. Attach snap fit calibration adapter to sensor fitting (Available from Anderson)
4. Sensor MUST remain stationary, with no movement
5. Perform ZERO calibration as described in this manual
6. Set pressure calibrator to proper range
7. Set multimeter to 4-20 mA DC scale, make connections at “TEST +” and “TEST -” testpoints
8. Using pressure pump, increase pressure until 20.00 mA is seen on the multimeter
9. Read “Water Column” from Pressure Calibrator – this is current sensor calibration
10. If value determined matches value etched on side of sensor, calibration ok
11. If value does not match value in model number, sensor calibration has been altered since unit left the factory – see sections that follow for proper re-calibration procedures

2.6 CALIBRATION - UTILIZING ON-BOARD SETUP

LD transmitters utilize on-board "Setup" circuitry to perform maintenance and calibration. With these tools, in addition to a digital multimeter, it is possible to perform a field calibration / re-calibration of the output range.

Note:

- **Use caution if altering factory calibration – no record will exist at Anderson pertaining to changes**
- **Calibration MUST remain within range parameters of unit – be sure to refer to tables provided**
- **Loop power MUST be supplied to sensor**

Tools Required: Digital Multimeter
Calculator

NOTE: When re-calibrating a unit, you must remain within unit FULL OPERATING RANGE (0- 72" w.c.).

1. Determine **Desired Calibration**, in Inches of Water Column ("WC)

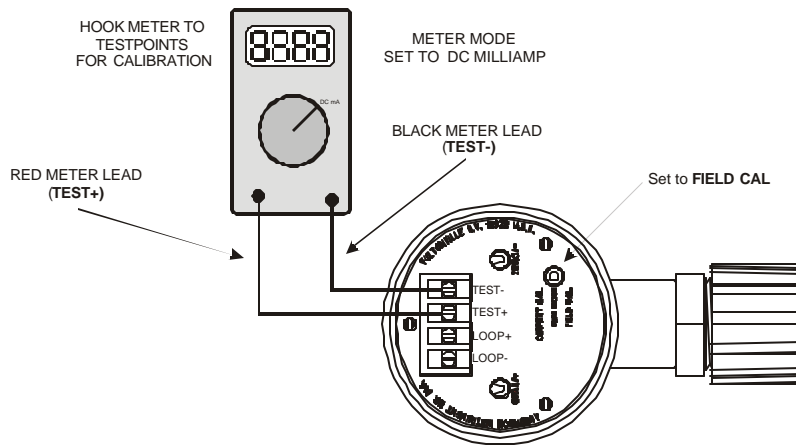
Example: Height Above Sensor In Inches (32") x
Specific Gravity of Product (1.032) = 33.0"WC

2. Determine **Proportional Cal Value** for calibration using the following formula:

$$[[[\text{STEP 1 VALUE} \div 145] \times 16] + 4.00] = \text{New Proportional Cal Value}$$

3. Perform meter hookup as shown in the following figure – Set **MODE SWITCH** to **FIELD CAL** position

FIGURE 2-8 FIELD CAL HOOKUP



4. Meter output will automatically move to 19.99 – sensor is waiting for entry of new calibration range
5. **SPAN** switch secondary function is “+”, and the **ZERO** switch secondary function is “-”
6. Using these two switches, raise or lower the value currently displayed on the meter until the value determined in step three (3) has been reached
7. Once the proper value has been reached, simultaneously depress **BOTH** the **SPAN/+** and the **ZERO/-** switches for **one (1) second** – this will lock in new sensor calibration
8. Calibration complete - mode switch set to "RUN MODE" position - place unit back into vessel - perform "**ZERO**" calibration

2.7 CALIBRATION - UTILIZING EXTERNAL PRESSURE SOURCE

If available, an External Pressure Calibrator may be used to perform a field calibration / re-calibration of the range on the LD Series Transmitter.

Note:

- **Use caution if altering factory calibration – no record will exist at Anderson pertaining to changes**
- **Calibration MUST remain within range parameters of unit – be sure to refer to tables provided**
- **Loop power MUST be supplied to sensor**

Tools Required: Pressure Calibrator (Equivalent to unit as described)
Digital Multimeter

1. Determine that the desired range is within Full Operating Range of sensor (72" w.c.)
2. Perform hookup of pressure calibrator as shown in the following figure – orient sensor in a location where easy access may be made to the internal setup switches
3. Perform hookup of Multimeter as shown in the figure on the following page:

FIGURE 2-9 PRESSURE PUMP HOOKUP

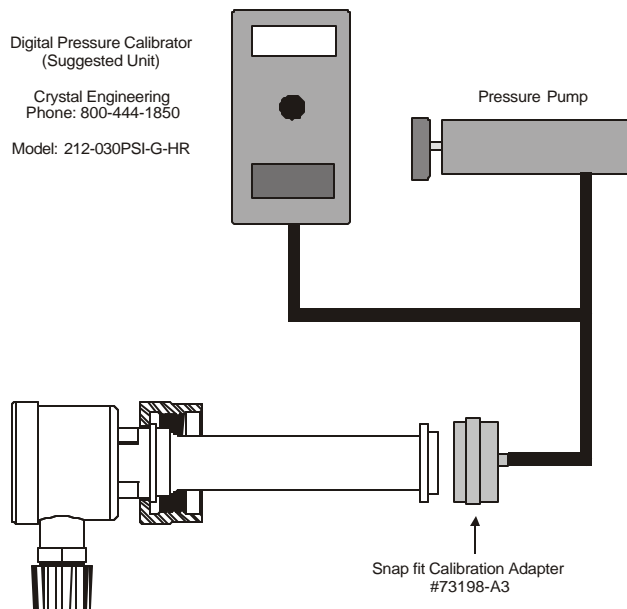
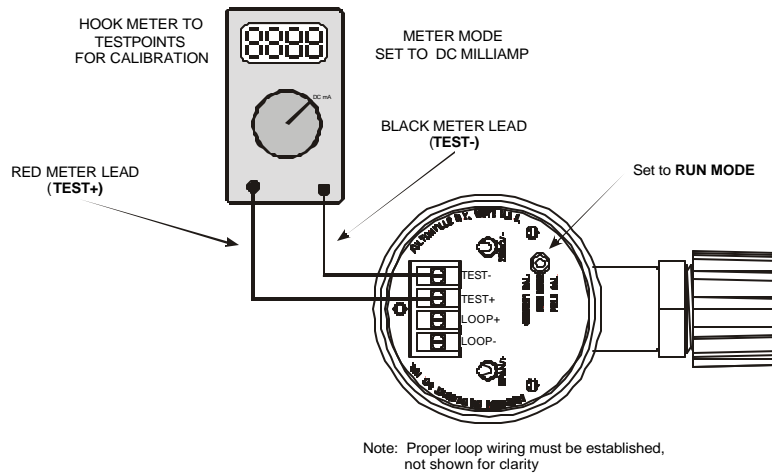


FIGURE 2-10 PRESSURE CAL HOOKUP



4. Sensor **MUST** remain stationary, with no movement
5. Perform **ZERO** calibration – depress **ZERO** switch for five (5) seconds – meter will show 4.00 mA
6. Using Pressure Pump, apply desired pressure to sensor
7. Once desired pressure has been achieved, depress **SPAN** switch for five (5) seconds – this will program new calibration range
8. Release calibration pump pressure
9. Be sure mA meter reading returns to 4.00 mA – If not, sensor orientation may have moved while performing calibration, return to step 5 and repeat process
10. Install sensor back into vessel and perform a ZERO calibration – unit is ready for service at this time

2.8 CONTROLLER TUNING

As depicted in Figure 2-1, the typical application utilizes the signal from the transmitter to interface with a programmable controller. In turn, this unit typically sends an output that is used to throttle a feed valve. For actual P (Proportional), I (Integral) and D (Derivative) tuning information, please consult the instruction manual provided with the controller. Some general controller setup guidelines are as follows:

$$\text{" WC} = (\text{Inches height} \times \text{specific gravity of product})$$

1. The transmitter is calibrated in " WC. If the vessel is less than 30" WC height, the default calibration for the transmitter remains at 30" WC. Be sure to set the controller accordingly.
2. Be sure that either the controller is capable of providing proper loop power, or that an external supply is utilized. Refer to the controller instruction manual for guidelines on proper wiring of an internal supply. Utilize Figure 2-3 as a reference to be sure that all loop polarities are wired correctly.
3. On a typical controller, the following are the basic requirements to perform initial startup. Again, refer to the actual manual for detailed instructions.
 - a. Specify a 4-20 mA input type to match the output of the transmitter.
 - b. Be sure any configuration switches internal to the controller are properly set.
 - c. Be sure wiring of loop/power source is correct.
 - d. Enter a "Lower" and "Upper" operating limit - typically 0 - 100%.

Section 3 Maintenance and Troubleshooting

3.1 GENERAL

Required maintenance of the LD transmitter includes a yearly calibration program. In addition, a visual check of the diaphragm and gasket should take place at minimum-6 month intervals. Small dents in the diaphragm will cause a "pre-load" or positive zero offset, which generally can be adjusted out. Larger dents, creases, or punctures are very detrimental and may require a complete repair or replacement.

- NOTE:** The transmitter should be left in place for normal cleaning operations. Removal of the unit opens risk for damage to the diaphragm area. If the transmitter must be removed, a protective cap should be immediately placed over the diaphragm area. Be sure that the cap does not press on the diaphragm directly.
- The transmitter has been designed to withstand typical process environments including cleaning and washdown. Electronics are self compensating for changes in process temperature, and provide a linear, repeatable output signal.
 - For proper operation, be sure that the diaphragm (sensing) portion of the unit remains free from damage. This portion should be well protected if the transmitter is removed from the process.
 - A typical "Zero" adjustment should be performed at one (1) year intervals.

3.2 CALIBRATION CHECKS

To maintain proper accuracy, Anderson recommends **yearly** ZERO signal (4.00 mA) checks. A record of these readings will help to maintain a consistent schedule. If re-zeroing does not correct inaccuracies seen in the receiver, calibration of the receiver itself should be performed. Consult associated manuals for your individual equipment.

- WARNING:** Unless performing full calibration of the unit, do not adjust the "SPAN". This adjustment is Factory set. Testing of the transmitter "SPAN" will require stepping through one of the procedures outlined in the Calibration section (section 2) or the use of a stand alone pressure calibration system. The unit may also be returned to the factory for calibration. Call Anderson Technical Services directly for further information.

3.3 VENT SYSTEM

The model LD Level Transmitter utilizes an integral stainless steel atmospheric vent. The system vent must be maintained to allow for proper operation of the unit.

- Be sure the atmospheric vent area is not obstructed. These ports must be open and free from debris. **DO NOT** use sharp objects to free foreign material from this area. Flush with warm-low pressure water.

3.4 TROUBLESHOOTING

As with any current loop, power supply and loop continuity are both imperative. If a problem occurs, a methodical approach, beginning at the power supply is best.

3.4.1 Troubleshooting Steps

1. Measure power supply voltage across "loop+" and "loop-" terminals. Meter will read between 12 and 40 VDC. (meter set to DC volts)
2. Disconnect one wire (+) from the signal receiver and install an accurate milliamp meter in series with the receiver. The signal should correspond proportionally to the height of liquid in the tank. (meter set to DC mA)

NOTE: Above may differ if signal scaling is being done via microprocessor based receiver. Product specific gravity values must be used in calculation.

3. If step 1 and 2 are satisfactory, the problem is with the receiver. (If supplied by Anderson, refer to the instruction manual for that instrument).
4. Check all wiring connections between loop components. If OK, proceed to step 5.
5. With loop disconnected, the next step is to determine if there is a short to the housing. This is accomplished by placing the (+) lead of the ohm meter on the loop+ terminal, and the (-) lead to the housing. The process should then be reversed. In both cases, the meter should register infinite resistance. The process should then be repeated on the loop- terminal of the sensor. Again, the meter should register infinite resistance. If test is OK, proceed to step 6,
6. Wire transmitter independently of loop using two 9 volt batteries for power and milliamp meter as a receiver. If signal is proper, approximately 4 mA with no product on sensor, then problem is with external wiring.

NOTE: Be sure to observe proper polarity as described in Figure 2-3

If any of the above indicate a transmitter problem, call your local distributor, or Anderson Technical Service directly.

Appendix A

Warranty and Return Statement

These products are sold by The Anderson Instrument Company (Anderson) under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to a purchase of these products, as new merchandise, directly from Anderson or from an Anderson distributor, representative or reseller, and are extended only to the first buyer thereof who purchases them other than for the purpose of resale.

Warranty

These products are warranted to be free from functional defects in materials and workmanship at the time the products leave the Anderson factory and to conform at that time to the specifications set forth in the relevant Anderson instruction manual or manuals, sheet or sheets, for such products for a period of two years.

THERE ARE NO EXPRESSED OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREIN AND ABOVE SET FORTH. ANDERSON MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCTS.

Limitations

Anderson shall not be liable for any incidental damages, consequential damages, special damages, or any other damages, costs or expenses excepting only the cost or expense of repair or replacement as described above.

Products must be installed and maintained in accordance with Anderson instructions. Users are responsible for the suitability of the products to their application. There is no warranty against damage resulting from corrosion, misapplication, improper specifications or other operating condition beyond our control. Claims against carriers for damage in transit must be filed by the buyer.

This warranty is void if the purchaser uses non-factory approved replacement parts and supplies or if the purchaser attempts to repair the product themselves or through a third party without Anderson authorization.

Returns

Anderson's sole and exclusive obligation and buyer's sole and exclusive remedy under the above warranty is limited to repairing or replacing (at Anderson's option), free of charge, the products which are reported in writing to Anderson at its main office indicated below.

Anderson is to be advised of return requests during normal business hours and such returns are to include a statement of the observed deficiency. The buyer shall pre-pay shipping charges for products returned and Anderson or its representative shall pay for the return of the products to the buyer.

Approved returns should be sent to: ANDERSON INSTRUMENT COMPANY INC.
156 AURIESVILLE ROAD
FULTONVILLE, NY 12072 USA

ATT: REPAIR DEPARTMENT